Paper No. 28

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte KOUHEI SHIMODA,
KAZUYA KAMITAKE, HIROHIKO NAKATA,
KAZUTAKA SASAKI and MASUHIRO NATSUHARA

Appeal No. 2002-2080
Application 9/358,484

ON BRIEF

Before WARREN, MOORE and POTEATE, *Administrative Patent Judges*.

WARREN, *Administrative Patent Judge*.

Decision on Appeal

This is an appeal under 35 U.S.C. § 134 from the decision of the examiner finally rejecting claims 21 through 30 and 32-39. In the amendment filed in response to the final rejection on December 14, 2001 (Paper No. 19), entered by the examiner in the advisory action of January 3, 2002 (Paper No. 20), appellants amended claims 25 and 29, and canceled claims 26, 27, 33, 38 and 39. These latter claims were included by the examiner in the listing of canceled claims in his letter of August 7, 2002 (Paper No. 26). Appellants further withdrew the appeal with respect to claims 36 and 37 in the reply brief. Thus, the appeal is dismissed with respect to claims 36 and 37.

Accordingly, claims 21 through 25, 28 through 30, 32, 34 and 35 remain for our consideration on appeal (see Paper No. 26). Claim 1 is illustrative of the claims on appeal:

21. A method for producing aluminum nitride ceramic having a dense smooth surface layer possessing a surface roughness Ra of lower than 0.3 μm and possessing no defect larger than 25 μm on its surface, comprising

(i) providing a sintered article of aluminum nitride and then applying at least one layer of a paste of oxide glass that contains no Na, no K, no Rb, and no Pb for said surface layer directly onto a surface of said sintered article of aluminum nitride and sintering said paste, or

(ii) providing a preform of aluminum nitride which is not yet sintered and then applying at least one layer of a paste of oxide glass that contains no Na, no K, no Rb, and no Pb for said surface layer directly onto a surface of said preform and sintering said paste and said preform,

wherein said paste is applied as a plurality of layers in which the layer adjacent to the sintered article or preform has a higher softening point than the other layers and wherein the final surface layer has a thickness between 10 μm and 250 μm after sintering, thereby producing an aluminum nitride ceramic having a dense smooth surface layer possessing a surface roughness Ra of lower than 0.3 μm and possessing no defect larger than 25 μm on its surface.

The appealed claims, as represented by claim 1, are drawn to a method for producing aluminum nitride ceramic having a dense smooth surface layer possessing a surface roughness Ra of lower than 0.3 μm and possessing no defect larger than 25 μm on its surface, comprising at least the step of applying at least one layer of a paste of specified oxide glass onto a surface of either (i) a sintered article of aluminum nitride and sintering the paste, or (ii) a preform of aluminum nitride and sintering the preform and the paste, wherein the paste is applied as a plurality of layers in which the layer adjacent to the sintered article or preform has a higher softening point than the other layers and wherein the final surface layer has a thickness between 10 μm and 250 μm after sintering. In other appealed claims, the separate layers can each be sintered as applied (claim 24); the sintered aluminum nitride can be limited with respect to oxygen, carbon and boron content (claim 32); the layer can be a single thick layer (claim 34); and the process can be specific to the preform of aluminum nitride (claim 35). According to appellants, the aluminum nitride ceramics so prepared have heat-radiation properties which make them useful, for example, as a substrate for integrated circuits (specification, e.g., page 1).

The references relied on by the examiner are:

Kondo et al. (Kondo)	5,122,930	Jun. 16, 1992

Toyoda et al. (Toyoda)[1] 6-1682 Jan. 11, 1994
(Japanese Kokai Patent Publication)

The examiner has rejected appealed claims 21 through 25, 28 through 30, 32, 34 and 35 under 35 U.S.C. § 103(a) as being unpatentable over Kondo in view of Toyoda (answer, pages 3-5).[2]

Appellants, in the brief (pages 4-5), group the appealed claims as follows: (1) claims 21-23, 25 and 28-30; (2) claim 32; (4) claim 34; (5) claim 35; and (6) claims 24 and 29.[3] Thus, we decide this appeal based on appealed claims 21, 24, 32, 34 and 35. 37 CFR § 1.192(c)(7) (2002).

We affirm the ground of rejection with respect to appealed claims 21 through 25, 28 through 30 and 34, and reverse the ground of rejection with respect to claims 32 and 35.

Rather than reiterate the respective positions advanced by the examiner and appellants, we refer to the examiner's answer and to appellants' brief and reply brief for a complete exposition thereof.

Opinion

Our consideration of the examiner's application of prior art to the appealed claims must begin with interpreting the language of the claims in light of the written description in appellants' specification as it would be interpreted by one of ordinary skill in this art, giving the claim terms their broadest reasonable interpretation consistent with the written description in the specification. *See, e.g., In re Hyatt, 2*11 F.3d 1367, 1372, 54 USPQ2d 1664, 1667 (Fed. Cir. 2000); *In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997), *In re Zletz*, 893 F.2d 319**,** 321-22, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989). The plain language of appealed claims 21, 32 and 34 contested here, requires "providing a sintered article of aluminum

[1] We refer in our decision to the translation of Toyoda prepared for the USPTO by The Ralph McElroy Translation Company (December, 1999).
[2] We modified the statement of the rejected claims appearing in the answer to reflect the claims on appeal.
[3] We modified the statement of the grouping of claims appearing in the brief to reflect the claims on appeal, and thus, group 3 is not listed.

nitride and then applying at least one layer of a past of oxide glass . . . directly onto a surface of said sintered article."

Appellants argue that this claim language in "[a]ll of the present claims except claim 33 recite embodiments in which oxide glass paste is applied **directly** onto the surface of a sintered article of aluminum nitride," (brief, page 6, bold emphasis in the original; see also page 5). Appellants further submit, with respect to Kondo, that the reference "would not have suggested a thick layer of oxide glass formed **directly on an aluminum nitride substrate**, as presently claimed, since there is a thick patterned electroconductive layer already on the substrate" (*id.*, page 7; bold emphasis in the original). Appellants argue with respect to Toyoda that because of the presence of the Al_2O_3 layer on the aluminum nitride substrate, the reference "teaches away from applying an oxide glass paste directly on the [aluminum nitride] substrate as presently claimed" *(id.*, page 8). Appellants state that "claim 21 was amended to emphasize that the thick layer is not applied over a patterned layer, by specifying steps of 'providing [a sintered article . . .] **and then** applying [a paste of oxide glass]'" (*id.,* bold emphasis in the original; *see also* reply brief pages 1-2). Appellants do not explain in the brief (page 9) how the same claim language appearing in *cancelled* claim 33 encompasses "a surface of the sintered article . . . [which] is oxidized before the sintered article . . . is coated with the paste of oxide glass" under certain dew point and temperature conditions, which limitation appears therein.[4]

The examiner has taken the position with respect to Kondo, that the insulative oxide glass layer "has to be applied *directly* onto the [aluminum nitride] substrate in order to maintain an insulative separation between wires *in the same conductive layer*," (answer, page 5; italicized emphasis in the original), and, in this respect, "[c]ontrary to applicant's [sic, appellants'] argument in the second paragraph of page 8 of the appeal brief, the claims do not exclude a patterned layer application step before the tick glass layer forming step" *(id.,* page 6). With respect to Toyoda, the examiner states that he disagrees with appellants' argument "that [Toyoda] does not teach forming thick glass layers *directly* on an [aluminum nitride] substrate" because "[m]uch like [appellants'] invention, [Toyoda] has discovered that oxidation of the surface of the

[4] *See above* p. 1. A copy of cancelled claim 33 appears in the appendix to the brief.

[aluminum nitride] substrate prior to glass layer formation enhances the ability of the glass layer to adhere to the substrate," which is a preferred embodiment of appellants and Toyoda (*id.*, italicized emphasis in the original). In this respect, the examiner states that "[t]he presence of [appellants'] claim 26 and the supporting disclosure in the [appellants'] specification prove this argument to be false" (*id.*, pages 6-7).

We observe that *cancelled* claim 26[5] specifies "a surface of said sintered article . . . of aluminum nitride is oxidized before said sintered article . . . is coated with said paste of oxide glass," and, in not specifying any conditions is broader in scope than *cancelled* claim 33. In the reply brief, appellants do not challenge the examiner's argument with respect to the disclosure in the specification and cancelled claim 26. For completeness with respect to our discussion here, and in view of the examiner's position, we find that Kondo teaches the formation of an oxide layer on the *surface* of the aluminum nitride substrate, which then becomes the oxide *surface* layer of the aluminum nitride substrate; that the patterned electroconductive oxide glass containing layer is formed on a portion of the oxide *surface* layer; and that, as pointed out by the examiner, the *portions* of the oxide *surface* layer *not* covered by the application of the insulative oxide glass layer are "a surface" on which the paste of oxide glass would be *directly* applied.

Appellants base their contentions with respect to the interpretation of the claim language on the language of the claim, making no reference to any disclosure in the written description of their specification. The difficulty that we have with appellants' position is that the plain language of the appealed claims does not specify the limitations embodied in appellants' expressed intentions with respect to the scope of the appealed claims, and such intentions do not limit the scope of the claims. *In re Cormany*, 476 F.2d 998, 1000-02, 177 USPQ 450, 451-53 (CCPA 1973).

The examiner does make reference to the written disclosure in the specification, but does not point to any particular disclosure to support his view of the appealed claims.

Accordingly, in order to consider the issues with respect to the application of prior art to appealed claims 1, 24, 32, 34 and 35, we must give the claim terms "a sintered article of aluminum nitride" and "a surface of said sintered article," the broadest reasonable interpretation

[5] *See above* p. 1. A copy of cancelled claim 26 appears in the appendix to the brief.

consistent with the written description in the specification. We find that one of ordinary skill in this art would have found the following in the written description of appellants' specification. Appellants disclose an "aluminum nitride ceramic comprising a sintered article consisting mainly of aluminum nitride and having a thermal conductivity higher than 100 W/m.K at room temperature and a smooth dense surface layer formed on a surface of the sintered article" which has the surface roughness and defect characteristics specified in the appealed claims (page 2, line 22, to page 3, line 1; *see also* page 3, lines 4-9) . Appellants further disclose that "[p]referably, the surface layer (**2**) [of the aluminum nitride ceramic of FIG. **1**] consists mainly of . . . oxide glass," wherein "[a]t least the first oxide glass layer deposited directly on a surface of the sintered article is preferably made of oxide glass which do not contain Na, K, Rb and Pb" (page 3, lines 12-13 and 19-21). The disclosed process is "characterized by the steps of applying a paste for said surface layer onto a surface of a sintered article . . . of aluminum nitride and sintering' (page 3, line 24, to page 4, line 2), wherein "[t]he surface layer [of the aluminum nitride ceramic] can be prepared by repeating two steps of applying an oxide glass paste onto a sintered article of [aluminum nitride] and sintering" (page 4, lines 6-8). The paste of oxide glass can be applied by "screen printing techniques" (e.g., page 13, lines 13-14).

It is clearly stated in the specification that "[p]referably a surface of the sintered article of aluminum nitride is oxidized before the paste of oxide glass is coated" (*id.*, lines 13-15), and that "[t]he content of [aluminum nitride] in the sintered article of [aluminum nitride] is preferably more than 80% by weight" and can contain other components (page 4, line 16, to page 5, line 18). In describing the oxidation surface treatment, it is disclosed that "an oxide layer (alumina layer)" can be formed (page 8, line 5). The nature of the oxidized surface of the aluminum nitride article was not reported in Examples 13 and 14.

The purpose of forming the aluminum nitride ceramic in the manner disclosed is "to improve thermal conductivity and to improve surface smoothness" so that the ceramic article can serve as, for example "a substrate for integrated circuits" (pages 1-2).

We find in the written description of appellants' specification no definition or other limitation with respect to "a surface" of "a sintered article of aluminum nitride" onto which at least one layer of paste of oxide glass is "directly" applied, either with respect to the character of

the surface, or the extent to which the "surface" must be covered by that first layer. We are of the opinion that it would reasonably appear to one skilled in this art from this disclosure that, broadly, "a sintered article" must only "consist mainly of aluminum nitride" and provide a "surface" upon which the "smooth dense surface layer" can be formed by the steps of applying a paste of oxide glass in the required single or plural layer(s) in order to prepare an aluminum nitride ceramic with thermal conductivity and surface smoothness, only the latter characteristic being specified in the appealed claims.

Thus, in giving the claim terms the broadest reasonable interpretation consistent with the written description in the specification, "a surface" of the "a sintered article of aluminum nitride" would include a surface of the aluminum nitride containing layer of the article, a modified surface of that layer, and a surface of a layer deposited on that layer.

Indeed, the only description that the specification provides for "a surface" is the preference for oxidation thereof prior to applying the paste of oxide glass, and since the "mainly" amount of aluminum nitride can be less than "preferably more than 80% by weight," the nature of the surface, without or without oxidation, is also not defined, the disclosure of "alumina layer" and the oxidized surfaces in the Examples notwithstanding. We find no specificity in this instance in the common dictionary meaning of the terms "surface" and "article," particularly since the terms are preceded by the indefinite article "a."[6] *See generally, KCJ Corp. v. Kinetic Concepts Inc.*, 223 F.3d 1351, 1355-56, 55 USPQ2d 1835, 1839 (Fed. Cir. 2000). We further find no basis in the plain language of the appealed claims or in the written description of the specification on which to read into the claims any limitation of the specification, including any preferred embodiment or example. *See generally*, *Morris, supra; see also Zletz*, *supra*; *In re Priest*, 582 F.2d 33, 37, 199 USPQ 11, 15 (CCPA 1978); *In re Prater*, 415 F.2d 1393, 1404-05, 162 USPQ 541, 550-51 (CCPA 1969). In this respect, it is appellants' burden to define the claimed invention encompassed by the appealed claims in the specification. *See Morris*, 127 F.3d at 1055-56, 44 USPQ2d at 1029.

[6] E.g., *The American Heritage Dictionary, Second College Edition*, pages 86, 130 and 1223 (Boston, Houghton Mifflin Company, 1982).

We determine that the transitional term "comprising" in these appealed claims would serve its customary purpose in claim construction of opening appealed claim 21 to encompass methods which include any additional steps, such as the step of oxidizing the surface of an aluminum nitride containing layer or the step of applying or forming a layer to the surface of the aluminum nitride containing layer, as disclosed in the specification and as embodied in *cancelled* claims 26 and 33. *See In re Baxter*, 656 F.2d 679, 686-87, 210 USPQ 795, 802-03 (CCPA 1981) ("As long as one of the monomers in the reaction is propylene, any other monomer may be present, because the term 'comprises' permits the *inclusion* of other steps, elements, or materials.").

Upon applying appealed claim 21, 24, 32, 34 and 35, as we have interpreted the claim language appearing therein above, with the combined teachings of Kondo and Toyoda, we agree with the examiner (answer, pages 3-4) that, *prima facie*, one of ordinary skill in this art routinely following the combined teachings of these references would have formed a dense smooth glass layer on a sintered aluminum nitride article by applying and sintering one or more layers of paste oxide glass on a surface of that article in the manner disclosed by Kondo and Toyoda, in the reasonable expectation of achieving the surface characteristics of the glass layers specified in the references for an aluminum nitride ceramic useful for the applications taught in the references, and thus would have arrived at a process encompassed by appealed claims 21, 24, and 34 without recourse to appellants' specification. *See, e.g., Pro-Mold & Tool Co. v. Great lakes Plastics Inc.*, 75 F.3d 1568, 1573, 37 USPQ 1626, 1629-30 (Fed. Cir. 1996); *In re Gorman*, 933 F.2d 982, 986-87, 18 USPQ2d 1885, 1888-89 (Fed. Cir. 1991); *In re Keller*, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981).

Accordingly, since a *prima facie* case of obviousness with respect to appealed claims 21, 24 and 34 has been established by the examiner over the combined teachings of Kondo and Toyoda, we have again evaluated all of the evidence of obviousness and nonobviousness based on the record as a whole, giving due consideration to the weight of appellants' arguments in the brief and reply brief. *See generally, In re Johnson*, 747 F.2d 1456, 1460, 223 USPQ 1260, 1263 (Fed. Cir. 1984); *In re Piasecki*, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984).

We have carefully considered all of appellants' arguments. Appellants submit that the process of Kondo applies a thick layer of paste oxide glass over a surface containing a pattern of electroconductive material, and thus falls outside of the appealed claims because the patterned surface is not "a surface" of "a sintered article of aluminum nitride" as required by the appealed claims (brief, pages 6-7 and 10). We cannot agree because as we have found (*see above* p. 5), the patterned surface of Kondo would include areas of the oxide layer on which the patterned layer is formed, and we determine here that such areas constitute "a surface" of "a sintered article of aluminum nitride" as we have interpreted these terms above. Indeed, as pointed out by the examiner (answer, e.g., pages 6 and 7-8), Kondo discloses process parameters for forming the oxide layer that encompasses the same process conditions specified for the formation of an oxide layer on the surface of an aluminum nitride containing layer in appellants' specification. Thus, on this record, we must conclude that Kondo would have reasonably disclosed to one of ordinary skill in this art at least a process for preparing an aluminum nitride ceramic having a dense smooth surface having characteristics falling within the claimed ranges, by applying a single thick layer of paste oxide glass directly to a surface of an aluminum nitride article, which process falls within the claimed process encompassed by appealed claim 34.

Appellants further submit that the process of Toyoda requires the presence of Al_2O_3 as a surface for the application of layers of paste glass, thus teaching away from applying the paste oxide glass directly to the aluminum nitride substrate (brief, page 8). We also cannot agree with this position because we have interpreted the appealed claims, as here represented by appealed claim 21, to encompass processes wherein "a surface" of "a sintered article of aluminum nitride" can be "a surface layer with an Al_2O_3 layer as the major component" as provided by Toyoda (page 4). Even if such a layer was excluded by language of appealed claim 21, this reference would have taught one of ordinary skill in this art that layers of paste oxide glass can be applied directly on the unmodified surface of the aluminum nitride containing substrate (page 3), and particularly since Toyoda teaches the advantage of the oxidized layer over the unmodified layer. We further find that Toyoda discloses the benefits of an SiO_2 layer formed on the "surface oxide layer," which "sintered article of aluminum nitride" would have "a surface" falling within appealed claim 21. Therefore, on this record, we conclude that at least, Toyoda would have

reasonably disclosed to one of ordinary skill in this art at least a process for preparing an aluminum nitride ceramic having a dense smooth surface, falling within the claimed surface characteristics, formed from several layer of paste oxide glass applied directly to a surface of an aluminum nitride article that falls within the claimed process encompassed by appealed claim 21.

Appellants submit that the process of appealed claim 24 is not suggested by either reference, particularly since Toyoda teaches that all of the applied paste oxide layers are sintered together (brief, pages 8-9). The examiner contends that the teachings of Kondo suggest sintering after the application of each layer, and thus the combined references would have suggested the claimed process of appealed claim 24 (answer, page 7). We agree with the examiner that one of ordinary skill in this art following the combined teachings of the references would have found therein the suggestion that sintering layers applied to the surface of an aluminum nitride article can be accomplished after the application of each paste oxide glass layer or after all of the paste oxide glass layers have been applied.

Accordingly, based on our consideration of the totality of the record before us, we have weighed the evidence of obviousness found in the combined teachings of Kondo and Toyoda with appellants' countervailing evidence of and argument for nonobviousness and conclude that the claimed invention encompassed by appealed claims 21 through 25, 28 through 30 and 34 would have been obvious as a matter of law under 35 U.S.C. § 103(a).

On this record, we agree with appellants that the examiner has not established that, *prima facie*, the process encompassed by appealed claims 32 and 35 would have been within the ordinary skill in this art. Appellants correctly point out that the disclosure at page 6 of the specification is not an admission of prior art as contended by the examiner (reply brief, page 3). Thus, the record does not contain evidence that supports the examiner's position that the composition of the aluminum nitride containing article specified in appealed claim 32 would have been within the ordinary skill in this art. Similarly, we agree with appellants that neither Kondo nor Toyoda teaches the application of a layer of paste oxide glass to a preform containing aluminum nitride, and thus do not support the examiner's position (reply brief, pages 2-3). Accordingly, we reverse the ground of rejection with respect to appealed claims 32 and 35.

The examiner's decision is affirmed-in-part.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED-IN-PART

CHARLES F. WARREN Administrative Patent Judge	)	
JAMES T. MOORE Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
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